

554, 415

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
11 November 2004 (11.11.2004)

PCT

(10) International Publication Number  
**WO 2004/096083 A2**

- (51) International Patent Classification<sup>7</sup>: **A61F**
- (21) International Application Number:  
PCT/US2004/013117
- (22) International Filing Date: 26 April 2004 (26.04.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/465,315 24 April 2003 (24.04.2003) US
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

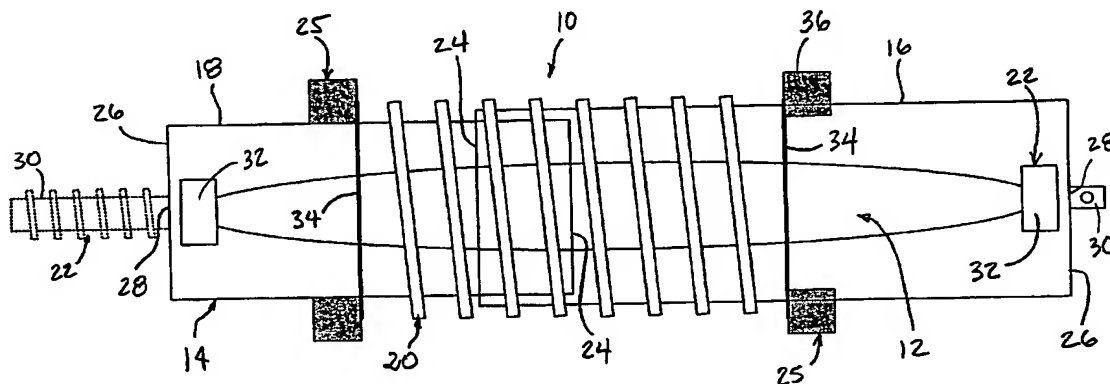
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **SPRING-OVER-MUSCLE ACTUATOR**



(57) Abstract: Pneumatic muscles capable of delivering bi-directional forces are described having an actuator with a tube or bladder surrounded by a braided material mounted in parallel with a resilient spring. When the bladder is pressurized with a pneumatic source, it expands, and its length contracts. During the contraction cycle, the resilient spring is compressed and stores energy until subsequently released, which corresponds when the pressure in the bladder is released. As the spring expands, it produces an expansion force. The contraction and expansion forces are controllable using a number of configurations, including changing the equilibrium position of the resilient spring, using a different rated bladder, and using different initial pressure.

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